AMATEUR RADIO

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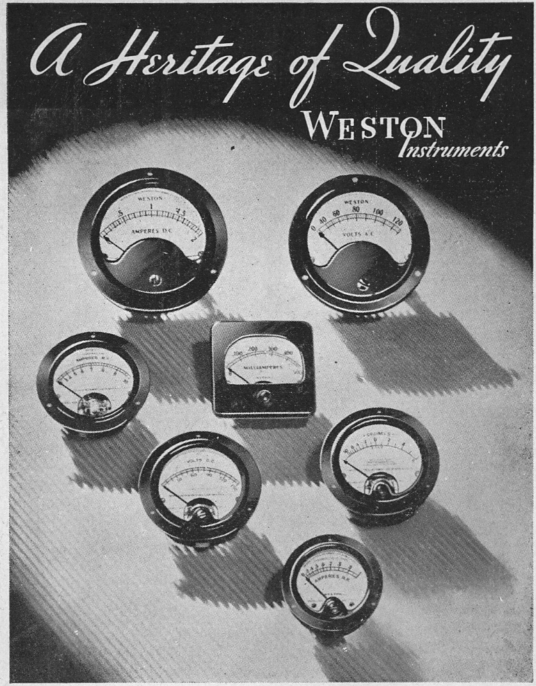
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AMATEUR RADIO

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EDITORIAL

DIGESTIVE TECHNICALITIES.

We present this issue as a new attempt to supply technical matter of importance in semi-digest form. Frankly, we are no longer able to obtain local contributions in such volume as would be necessary to maintain our usual monthly issue. Owing to such a high percentage of our fraternity being away on active service, it has become increasingly difficult to obtain technical articles and divisional notes in the usual volume. We must therefore turn to the efforts of our overseas contemporaries for this material.

By special arrangement with one of our esteemed advertisers, McGill's Agency, Elizabeth Street, Melbourne, we have access to Mr. Radford's entire electrical and radio magazine department.

We intend to present each month outstanding extracts, suitably acknowledged, from the world's best technical journals, of subjects suited to the experimental game.

The choice of suitable articles by the technical editor entails a great deal of work and we will endeavour to present only such articles as will be of "first class" quality and those not usually perused by our readers.

We feel that no digest would be complete without a few notes and personal paragraphs not forgetting our new innovation, "Short Wave Notes." Also we hope you will appreciate the technical editor's "Bookshop Smatterings," which will give our readers a general outline on some good technical reading.

The editor receives a few letters from overseas troops who write to advise some (censored) details of their movements under war conditions. You will find elsewhere in this issue a letter from ex VK3IR, which we are printing as an encouragement to others, similarly situated, to send along their contributions.

We have received many letters from "Amateurs" generally who have taken grave exception to the remarks attributed to the Post Master General, Mr. Thorby, and recorded in the daily press. Some of these reports of amateurs who infringe the law are unfair as well as humorous. It need not be pointed out that we in no way support anyone who breaks the law by transmitting signals of any kind, but we do feel that such remarks as appeared in the "Sydney Sunday Telegraph" to the effect that "Young people fiddle and tinker with radio transmitters and do not realise how serious it is," would pre-suppose that delicensed experimenters were children who did not know the difference between right and wrong.

We do not know for certain whether the persons detected operating unlicensed transmitters were delicensed experimenters, but we are prepared to bet that not more than one or two ever possessed a licence in pre-war days.

When one thinks of the fact that about eight hundred or more experimental licensees have joined up with the services, the percentage of one or two to eight hundred warrants a more exact definition by the authorities of the term amateur operators when reporting breaches of the regulations in the daily press.

Electrical Instruments

THEIR EARLY BEGINNINGS

By VK2WN.

When Prehistoric Man first communicated with his fellows by means of articulated speech, the first big step in communications had been achieved — Man could speak over short distances and convey information and directions. This advance was far more important to mankind than the entire development of the science of Radio communications—for without speech no civilisation is complete.

So it is that from insignificant, hardly perceptible beginnings spring the most radical and extensive sciences that go to make present day civilisation what it is.

It has been said that electrical instruments are the eyes and ears of industry to-day. They are essential to the maintenance of our communications and our industries. In this short article, the writer will say something of the early beginnings of electrical instruments and trace their developments to present day standards of perfection.

By electrical instruments we mean devices which indicate or record quantities or levels of electric charge, force, energy, and power, in the scientific sense. Since knowledge of electricity goes back barely over one century, one might expect that the first developments in instruments occurred since that time. However, the mechanical features of electrical instruments are fundamentally the same as those of other instruments such as used to measure water and air pressures, time (clocks), temperature, etc. We find that the first step was concerned with the measurement of time.

About the year 300 B.C., the Egyptians, apparently dissatisfied with the accepted forms of sundial, devised a clock which was driven by water power. A circular dial marked in 24 divisions was traversed daily by a pointer pivoted at the centre. The shaft carrying the pointer also had a small pinion fitted which meshed with a vertical rack. At its lower end the rack was attached to a floating piston. This piston floated on the surface of the water contained in a cylinder. The level of the water in this cylinder is steadily raised by the dripping of water from an overhead tank. The rate of flow could be adjusted to correct the speed of the pointer so that it could be made to keep correct time.

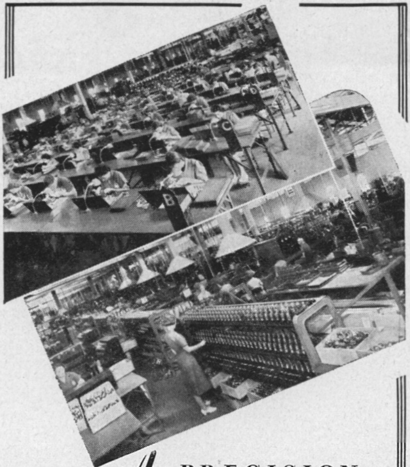
This early device contains practically all the basic requirements of present - day instruments. The rack and pinion provides a good movement amplifier. The piston is automatically damped in its cylinder by the water and there is adjustment to correct inaccuracies.

We can safely give credit for the present day perfection of mechanical detail to the watchmakers of old and their present-day successors. This development is a story in itself, and could not be covered with full justice in this script. Suffice it to say that the most outstanding improvement in clocks, so far as their design affects electrical instruments, was the introduction of jewel bearings in 1704. This helped to overcome the big source of error-friction.

Most electrical instruments have, as part of their mechanism, a magnet, either of the permanent or electromagnetic type. It is not generally realised that magnets were in use by the Chinese many thousands of years ago. They used a natural magnetic ore of iron, Ferric Oxide (Lodestone) as a compass.

"In 2634 B.C., the Emperor Hoang-ti attacked one Tchi-yeou on the plains of Tchou-hou, and finding his army embarrassed by a thick fog raised by the enemy, constructed a chariot (Tchi-nan) for indicating the south so as to distinguish the four cardinal points, and was thus able to pursue Tchi-yeou and take him prisoner."

Lucretius, the Roman writer, has stated in his writings that the Romans and Greeks were aware, not only of the attraction of the magnetic ore for iron particles, but also of the repulsion of suitable poles of the



magnetic ore. This being so, the major properties of permanent magnets were known in the first century before Christ. The Greeks and Romans also knew that soft iron could be made magnetic under the influence of magnetic ore.

From this point forward, great use was made of the properties of permanent magnets for navigation, and thus another branch of science contributed to the perfecting of our present-day electrical instruments.

The real tie-up with our subject did not come until the discovery of current electricity was made. This occurred in 1800, when Volta was experimenting with his "Voltaic pile" or "Crown of Cups." It was in 1819 that Oersted conducted a very simple experiment to show that magnetism was connected with electricity. He found that a magnetic needle was deflected when brought near a wire carrying a current so that it took up a position at right angles to the wire. This was rapidly followed by an experiment using parallel wires, and in 1837, a coil was used by Pouillet to construct his "Tangent Galvanometer," well known to students of electricity.

The Tangent Galvanometer was useful for measuring electric currents, but suffered a drawback in that it had to be set in a fixed direction so that the earth's magnetic field acted as a restraining force. In 1827, Nobeli constructed his "Astatic" Galvanometer, which used two permanent magnets of nearly equal strength set on a common shaft to oppose each other. The associated coil was set to influence both magnets, and as they were equal and opposite, the restoring force of the earth's field was very small and much greater sensitivity could be obtained. The instrument was called a "Galvanometer" in honour of Galvani.

In 1820-1821, Ampere and Arago working independently, passed currents through coils of wire, which were moved along bars of steel to make them strong permanent magnets. Four years later, Sturgeon made the first soft iron electro magnet on record. This only kept its magnetic current while the current flowed. In the succeeding few years, many powerful electro magnets were constructed by various people. Henry was the first person to use insulated wire in his coils, and it was after him that the unit of inductance was named.

About this time something significant was happening in a different sphere. In 1821, Seebeck discovered the Thermoelectric effect, or as it is known, the "Seebeck Effect." A potential of a few millivolts is generated when the junction of dissimilar metals is heated. A closed circuit is essential, having both "hot" and "cold" junctions. In 1827, Ohm used a Thermoelectric "Pole," several elements each having a hot and cold junction to prove his now famous Ohm Law. This principle is used in present-day Pyrometers for the measurement of high temperature temperature and also in Radio Frequency Ammeters.

One major problem in the mechanical design of instruments is that of damping. Obviosuly it is important to steady the pointer of an instrument so that it will not flicker backwards and forwards across the dial. Various methods have been used, from a simple vane moving in air to the magnetic damping produced by Eddy currents in a disc moving in a magnetic field. Some instruments are damped by means of oil, which limits the speed of movement of the pointer. The principle of Eddy current damping was discovered by Arago in 1825, but was not explained till Faraday found that the disc got warm by the passage of electric currents. That was twenty years later. This is the basis of electro magnetic damping used in present day instruments—in fact, even in the KW-hour meter installed outside your home may be found one such Eddy current damping device.

The principle of the moving coil-permanent magnet instrument was first employed by De La Rive in 1850, but we do not know if it was applied to this end. The first commercial patent for such an instrument was that of Varley, an Englishman, in 1856. The application stated that the device was intended for use both as an instrument and as a relay. It used a horseshoe permanent magnet and a soft iron magnet inside the coil to concentrate the magnetic field. The axle and pivots attached to the moving coil are very similar to later commercial designs. Varley in his patent application says that the current may be led into the

coil by means of hairsprings, by platinum dipped in mercury, or by dividing the axle n half and insulating the halves. The coil ends in this case connected to the two axles and the circuit was completed through the bearings.

Thus the business of measuring up electrical quantities was started. Since that time instruments have been of extreme value in providing quantitative measurements required by the advancing science of electricity.

Most readers will be familiar with the various types of instruments in use to-day for common measurements. We know that their accuracy is greatly improved, that they are more uniform in make-up, and now we notice quite a note of modernity in the streamline designs that are now coming to us.

However, perhaps a word about the trend in the near future would be in order.

The most striking advance in the U.S.A. is the general acceptance of plug-in instruments. A standard type of socket has been devised, into which may be plugged ammeters, voltmeters, wattmeters, Power Factor meters, Kiliwatt-hour meters, both indicating and recording types. In fact, any type of indicator, recorder, or metering device may now be "plugged-in." By means of these, it is a matter of seconds to check up completely on the performance of any piece of apparatus or production equipment, be it in a laboratory, workshop, or factory production line.

The tendency with portable instruments to build many types of instruments in one compact case is going further and further.

Recording instruments are rapidly coming more and more into general usage, since it is realised that one cannot keep a continuous eye on all the instruments that confront one. Also, valuable production data may be obtained from the load curves obtained from these recorders, whilst complaints to power companies about varying voltages or frequencies are rapidly arbitrated.

(Continued on page 13)

Applications of the Voltage Doubler Rectifier

By M. A. Honnell,
Instructor, Electrical Engineering. Georgia Tech.

The double-diode voltage-doubler rectifier is widely used in the power supplies of radio receivers and of amplifiers, but is used to a very limited extent in other electronic applications. A 6H6 twin diode tube connected as a voltage-doubler detector operates successfully at radio frequencies and presents certain inherent advantages not offered by the usual half-wave or full-wave detector circuits.

Fig. 1-A is the basic diagram of the half-wave rectifier detector. If R is large as compared to the diode resistance, and if C has a low reactance at the frequency of the applied voltage, Eac, the d-c voltage developed across R. is practically equal to the peak value of the applied voltage.

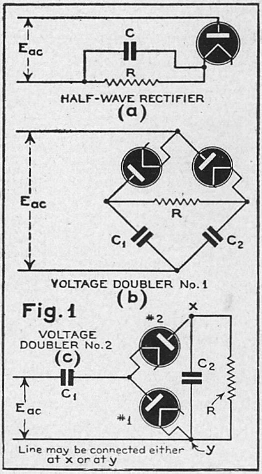
Fig. 1-B shows the conventional voltage-doubler rectifier circuit in which the series-connected condensers C1 and C2 are charged in succession on alternate half cycles of the applied voltage Eac. For light loads, or a high load resistance, the d-c voltage developed across R is very nearly twice the peak a-c input voltage. The lowest ripple frequency present in the output is twice the input frequency.

Fig. 1-C shows another voltage-doubler rectifiér circuit in which C1 is charged to Eac peak during the half cycle that diode No. 1 conducts current, and then C1 in series with the line charges condenser C2 to twice Eac peak on the next half cycle, when diode No. 2 conducts current. From the power supply standpoint, this circuit presents two disadvantages:

(1) Condenser C2 must have a voltage rating of twice the peak a-c input voltage.

(2) The lowest ripple frequency present in the output is the same as the input frequency, therefore, filtering is more difficult than in the conventional voltage-doubler circuit.

In Fig. 2 are shown performance curves for a 6H6 employed as a half-wave rectifier and as a voltage doubler obtained at a frequency of 60 cycles with C1 and C2 equal to two



microfarads and load resistance as indicated. These values are the 60-cycle equivalents of the values ordinarily employed with diode detectors at broadcast frequencies. The curves check well at a frequency of one megacycle. At high frequencies the cathode-to-cathode capacity which is

shunted across one of the diodes in both circuits becomes objectionable.

A 6H6 used as a voltage-doubler detector develops approximately twice the audio-frequency voltage and d-c voltage as compared to the conventional half-wave detector for a given modulated input voltage. The detection efficiency, the ratio of the output d-c voltage to the peak a-c input voltage is from 160 per cent. to 190 per cent. in practical circuits. Fig. 2 shows that the voltage-doubler detector is quite linear for large input voltages.

It is seen that the voltage-doubler detector provides a high bias voltage for automatic volume control, volume expander, volume compressor and similar circuits. As the two voltage doublers deliver approximately the same output voltage when equivalent RC values are employed, the choice of either voltage doubler for use as a detector depends largely on the circuit arrangement desired.

The diode voltage doublers are particularly convenient for use in vacuum-tube voltmeters in which application they are sensitive full-wave peak voltmeters. With condensers C1 and C2 equal to from 0.01 mfd to 0.05 mfd and R equal to from 2 megohms to 10 megohms, or higher, the voltage developed across R is independent of frequency over a wide frequency range, and is directly proportional to the input voltage. If the voltmeter is to be used at low frequencies the condensers should be at least one microfarad.

The voltage developed across R is equal to the sum of the positive and the negative peaks of the input voltage. Therefore, the voltmeter is not subject to turnover, which is the change in reading of a vacuum-tube voltmeter when its input terminals are reversed, if the voltage measured contains even harmonics in such phase position that the positive and the negative half cycles have different peak values.

A decided advantage in the use of either voltage doubler in a voltmeter for a-c measurements is that the condensers break the d-c path in the input circuit so that the instrument will read only the a-c component of the input voltage, should it contain a d-c component. Doubler No. 2 possesses an advantage over doubler No. 1 in that there is a common input and output terminal, which permits the use of a common ground point. For precise measurements, the small e-m-f due to the electron emission current flowing through R must be balanced out, as it approaches 0.5 to 1 volt in magnitude.

The indicating device to be used with the doubler voltmeter may consist of one of the following:—

6H6 PERFORMANCE CURVES
C - 2 MFD.

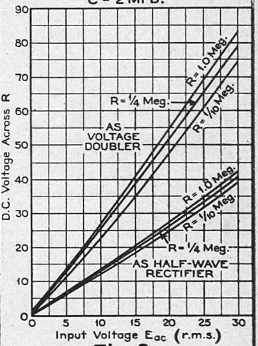


Fig. 2

(1) A microammeter or a milliammeter in series with R.
(2) A d-c potentiometer with a galvanometer to indicate when a balance is obtained between the voltmeter output voltage and the voltage across the potentiometer terminals.
(3) A triode d-c amplifier, preferably of the degenerative type with zero balance for the meter.

No matter how tough things get, that well-known Chinese operator, Wun Long See Cue, will be still going strong. As Confucius never said—"Lid who call CQ too long never paper wall, but sure plaster band."

—W1JPE

40—CM Waves in Aviation

Tests at M.I.T. reveal practical apparatus for generating a 40-cm. "hillside" of signal for blind landing of airplanes. Horn radiators and a receiver having 15-microvolt sensitivity show practicability of 700-mc. communication.

Recent progress in the field of the ultra-ultra high frequencies, above 500 Mc., has consisted principally in the development of more efficient generators, more sensitive detectors. Behind the scenes, however, several organisations have been working toward the application of the very short waves to the problems of aerial navigation and guidance. One of the outstanding examples of this work is the collaboration between the Civil Aeronautics Authority and the Massachusetts Institute of Technology on a system of instrument landing which employs 40 centimeter waves and which makes use of nearly all of the modern developments in the field of microwave research. The system is the solution of a problem proposed by a C.A.A. engineer, Irving Metcalf, and developed in practical form by the electrical engineering department staff of M.I.T., under Professor E. L. Bowles. The apparatus was recently demonstrated in experimental form to C.A.A. officials at the East Boston airport.

Beams from Horn Radiators.

The transmitting equipment operates on a frequency of approximately 700 Mc. At such high frequencies, beams may be formed by radiating the energy from horn structures of convenient dimensions. Two such horns were used in the demonstration, each fed by a separate transmitter. The horns are wooden structures, about 26 feet deep, and 10 by 2½ feet at the mouth. They are lined with copper sheeting. At the end of each horn is a rectangular box which closes the throat. Inside the box is a quarter-wave antenna which protrudes into the box directly from a coaxial transmission line. The length of the antenna is about 19 cms, (roughly 4 inches). The 700-Mc. energy radiated from the antenna is conveyed down the horn to its mouth and there it spreads out in a flat fan-like pattern, whose width is at right angles to the long dimension of the mouth of the horn and parallel to the ground. (This relationship obeys the rule for diffraction effects, namely that the diffraction pattern spreads widest at right angles to the long dimension of the slit). Consequently the horn generates a flat nearly horizontal beam of signal, inclined at a slight angle to the airport surface. Two horns are used, each fed with signals of the same frequency, one modulated at 150 cps., the other at 90 cps. The horns are set up so that the central axis of one makes an angle of 5 degrees to the earth's surface, the other an angle of 10 degrees. The fan-like beams from the two horns overlap in a region which extends from about 3 degrees to 7 degrees. The overlap region constitutes a "hillside" of signal down which the plane glides to the airport surface. In the plane, the receiver tells the pilot when both signals (90 cps. and 150 cps. modulations), are received. When both are received at equal strength the glide angle is 7.5 degrees, which is somewhat steep for most aircraft, hence the receiver is set to indicate the proper position when the upper beam is received somewhat stronger than the lower, producing a normal glide of from 3 to 4 degrees.

The arrangement just described gives so-called "vertical guidance," that is it guides the plain in the up-down direction. Similar guidance in the horizontal or left-right direction is also necessary. In the demonstration the horizontal guidance was provided by a conventional long-range runway localiser transmitter, designed and operated by engineers of the Washington Institute of Technology. When the C.A.A.-M.I.T. system is completed the horizontal guidance may be set up by 40-cm. waves in the same fashion as the vertical guidance.

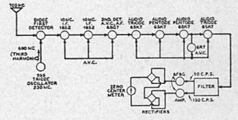
The 700-Mc. Generators.

The horn structures just described are highly directional (in the plane of the fan pattern), and hence conserve the energy fed to them from the transmitter proper. For this reason, very small amounts of transmitter power will suffice, so long as the receiver in the plane has adequate sensitivity. Two possibilities arise: a transmitter of several hundred watts power may be used with an insensitive receiver, or a few watts of transmitter power may be used with an elaborate receiver. The low-power arrangement was used at the demonstration, although the high-power method has been tested with success.

The generation of hundreds of watts of power at 700 Mc. has been possible only since the advent of the beam-type of cathode-ray generator. One of the "Klystron" generators originated at Stanford University was available for the purpose, and was set up in operating condition on the airport, mounted in a truck complete with high voltage power supply and a continuous vacuum-pumping system. With less than 100 watts output, in previous tests, adequate signal strength was received in the plane at a distance of more than 25 miles, which constitutes a record for microwave transmissions. In the demonstration, however, it was more convenient to use lower power and to rely on the high sensitivity of the receiver. Accordingly, two conventional triode oscillators were used, one for each horn radiator. The oscillators employed the Western Electric type 316A door-knob tubes in coaxial-line tuned circuits, and were fed with about 25 watts of power, one modulated at 90 cps., the other at 150 cps. The output of the oscillators was in the neighbourhood of one watt at 700 Mc. (43cms), but even this small power was adequate to produce a strong signal at distances greater than five miles. Since the glide path to the airport surface is usually less than five miles long, the performance was satisfactory, despite the very low power of the transmitters.

The 15-Microvolt Microwave Receiver.

From the standpoint of radio engineering, the most significant development in the project (save possibly the use of horn radiators) is the 40-cm. receiver. This receiver displays the phenomenal sensitivity of 15 microvolts input for full output (off-scale swing on the indicating meter). The tube lineup is shown in the accompanying figure. The antenna is of the coaxial variety developed by the Bell Labs. It is fixed to one of the wing struts. The coaxial lead-in connects to the input circuit. The first detector is a diode tube, a W.E. development type. This tube serves two functions. In the first place it develops the third harmonic of the oscillator output, and in the second place it mixes this third harmonic with the input signal, producing a 10-Mc. intermediate frequency. The dual aspect of the diode action is illustrated in the accompanying diagram. Three tuned circuits are connected in series with the diode, as shown, The first is tuned to 700 Mc., the input frequency.



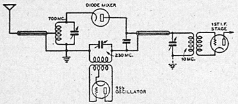
Tube line-up of the receiver. Two 700-Mc signals, modulated at 90 and 150 cps respectively, are amplified several hundred thousand times before being separated in a filter and applied to the indicating meter.

The second is tuned to 230 Mc., the oscillator frequency, and the third is tuned to 10 Mc., the intermediate frequency. At other than these resonant frequencies, the tuned circuits are essentially short circuits, so it is possible to consider the action of each circuit as though it were the only element in the series with the diode. Hence the diode produces a 690 Mc. frequency as the third harmonic of the oscillator voltage, mixes it with the 700 Mc., input, and derives the 10 Mc. i.f. voltage, simultaneously.

The oscillator proper, which employs a 955 acorn triode, is a specially designed coaxial tuned circuit similar to those developed by Peterson. The tuned circuit is in the form of a high-Q resonator, which encloses the tube, and which is so proportioned as to produce a highly stabilised output.

The i.f. output of the first detector is amplified in two 1852 i.f. stages,

which pass a band several hundred kilocycles wide, but which develop a gain of several thousand times overall. The second detector is a diode element in a 6SQ7 diode-triode tube. Then follows the triode section of the same tube as an a.f. amplifier. A.v.c. voltage is developed and applied to the 1852 tubes. The audio output of



The diode first-detector circuit in the superheterodyne receiver. Circuits tuned to the signal frequency, the oscillator frequency and the intermediate frequency are connected in series with the diode, which develops the third harmonic of the oscillator output and mixes it with the signal, simultaneously.

the 6SQ7 is then fed to an elaborate a.v.c. controlled audio amplifier employing four 6SK7 tubes, the first and last triodes, the others as pentodes.

The output of the third 6SK7 feeds a 6R7 which acts as an a.v.c. diode and amplifier. A.v.c. voltage is applied to all four 6SK7's, with the result that the output is substantially constant (within about 20 per cent.) with audio frequency inputs ranging from one millivolt to three volts. The gain in this amplifier is very great, of the order of 100,000 times. The problem of motor-boating and noise has been solved by the use of resistance-capacitance bandpass couplings between stages, which pass components from 50 to 400 cycles, thus including the 90-cps and 150-cps. modulations which are of importance, but discriminating against noise, and inhibiting low-frequency oscillations.

The output of the final 6SK7 amplifier leads to a filter which separates the 90-cps signal from the 150 cps. Each of these components is amplified individually in the sections of a 6F8G double-triode, and applied to two copper oxide bridge-type rectifiers. The connection between opposed outputs of the two bridges is made to a zero-center microammeter which thereby is made to indicate the relative strength of the 90 and 150-cps components. The gain of the 90-cps channel may be varied in the 6F8G stage relative to that in the 150 cps channel. This allows a zero-center indication to be obtained with varying ratios of 90 cps to 160 cps modulation, which in turn corresponds to positions in the upper and lower portions of the overlap region between the two fan patterns. By adjusting the relative gain of the two channels, the glide angle may be adjusted to suit the landing characteristics of different types of planes.

Observations During Test Flights.

In the test flights, the pilot flew about five miles from the airport, and picked up the glide path at an altitude of about 900 feet. By keeping the two cross pointers on the indicating instrument (one for the vertical guidance, the other for the horizontal), he guided the plane to the airport surface, but did not land because of a high crosswind which would have made landing difficult. Throughout the descent, the rate of climb meter and the airspeed indicator remained fixed in position, indicating that the plane was following a straight line to the ground. The straight-line aspect of the system is an important distinction from that of the conventional longer-wave instrument-landing systems, which follow a more or less curved contour of constant signal strength. The straight line path of the new system makes a definite point of contact with the ground, so that the plane reached its lowest altitude over a region no more than 50 feet in diameter.

The indications of the system were also made to appear on a cathode-ray tube, on whose face three spots appeared. The spots were formed by a commutating system, and were so controlled that they indicated not only the position of the plane relative to the glide path but also the tilt of the plane's wings, and its azimuthal position. The latter indications were derived electrically from the gyro compass and artificial horizon instruments in the plane, in the manner described in the reference previously cited. The three luminescent spots have the appearance of fixed spots on the ground, and hence allow the pilot to judge almost instinctively his position relative to the airport at all times during the descent.

Since the horns determine the shape of the pattern, the glide path is not changed by variations on the

airport surface, such as would be caused by a snowfall. The signal regions extend a considerable distance to the left and right of the horn openings, hence it is quite feasible to place the horns to one side of the glide path, and thus remove them from the airport surface.

(Continued from page 7)

On the technical side eyery year sees an improvement in the accuracy obtainable with commercial instruments. Friction and other losses are being reduced, torque and overload capacity increased. Sensible, easily read dials are more in prominence, and back of dial illumination is here to stay.

In conclusion, it should be said that the writer has drawn freely from a publication, "Electrical Instruments—the Eyes and Ears of Industry," for the historical items. This is a publication put out by the Westinghouse Electric and M'f'g Co.,

The March issue of "QSO," the official organ of the Resau Belge, records the passing of its Vice-Persident, ON4LM, Colonel Martin.

Recent issues of "Break In," the journal of the N.Z.A.R.T., records the deaths of ZL1AR, ZL2LG, and ZL3JT.

ZL1AR, Les Mellars, of dx fame and well-known to all VK's., was drowned as the result of a yachting tragedy on January 13th.

ZL3JT, Aircraftsman Doug. Birbeck, met his death in a plane crash near Christchurch, while ZL2LG, Leading-Aircraftsman Jack Langridge, of the R.A.F., has been posted as missing during a Norwegian raid on April 11th.

Frequency Modulation

An up-to-the-minute summary on frequency modulation. This is the first of a series of two articles on this interesting subject.

Something new and vital has come to radio. Wide-band frequency modulation offers the set manufacturer, the seller, and the user of radio the possibility for a new era in which performance will be paramount. The industry welcomed the recent upward trend in prices, small as it was. F-m is a proven system, standing ready to free it from "price" standards, give it instead a "quality" standard.

"Fortune" magazine, in its October issue, insists that 40,000,000 home receivers and 750 or 800 transmitters became obsolete on the day the f-m system was perfected. Engineers within the industry are more conservative. They know that years may be needed to change two billion dollars worth of equipment to another system, no matter how superior that system might be.

Those who have not followed the progress of f-m will be amazed at its advancement.

The scientist and engineer have presented this development to us all. Will the public demand the refinements and greater enjoyment promised by f-m? A tremendous replacement volume hangs on the answer.

From the standpoint of the consumer, f-m transmission has two major advantages. First, is its amazing fidelity. Music and speech have a natural sound, you hear a truer duplication of the original programme in the studio. High fidelity is commercial, not experimental.

Noise Reduction.

The freedom from atmospheric disturbances and local noise, which the buying public group together as static, is equally noteworthy. No longer will it be necessary to turn off your favourite programme because a thunder storm is brewing. A bolt of lightning may strike the transmitter and cause only a mild click in your receiver. All interference is reduced. Faults associated with radio since its earliest days are wiped out or reduced far below what is considered acceptable to-day.

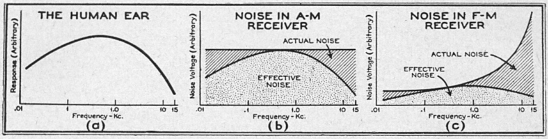
Many technical factors combine to give this vastly improved reception. One advantage of the f-m system is that radio-frequency noise which may occur between the transmitter and receiver is not evenly distributed throughout the audible range when it is reproduced in the speaker. It is a peculiarity of f-m that these noises, due to what we normally call static, are minimised at the lower audio frequencies. They increase steadily as we approach the limit of human hearing at about 15 kc. The noise and interference continue to increase still further up to 75 or 100 kc., and some part of this disturbance may pass through the receiver.

No human ear, however, can detect the part of this distortion which occurs above about 15 kc. The human ear also is much more sensitive to distortion at low pitch. Thus this peculiar distribution, of what we may call the disturbance energy, occurs in such a way that the human ear rejects by far the greatest part of it entirely, and is most sensitive in the region where the f-m system most completely wipes out the disturbing sounds. The amount of advantage accruing to f-m depends, of course, upon the keenness of hearing of each individual. A number of tests, however, show that at least 50 per cent. more actual audible distortion may be present in an f-m programme than in an a-m programme, yet the human ear would rank them both equally acceptable and free from objectionable disturbances. This means that an f-m programme may be received with enjoyment in an area where local electrical disturbances, whether natural or man-made, would normally make pleasant listening an impossibility. See Fig. 1.

In addition, some disturbances are themselves of definite band width, or affect only a certain band of fre-

quencies in the transmitted signal. If the programme we hear in our receiver is carried to us through a system which is only 10 kc. wide, then a disturbance affecting a band 1 kc. wide will cause a certain amount of distortion. If, on the other hand, our receiver brings us a programme by means of an energy band 100 kc. wide, then this 1 kc. disturbance will cause less distortion than occurred in the first case. If one f-m system operates with a swing of 50 kc. each side of its carrier, and another with a swing of 5 kc. each side of its carrier, the first transmitter should show an improvement of at least 10 to 1 as compared to the second in its ability to suppress noise.

The actual figures are astounding. When the peak value of the disturbance is less than 10 per cent. of the signal (both measured in the limiter stage of the f-m receiver) then the energy of this disturbance after rectification will be reduced by almost 1100 to 1. For noise voltage upwards of 25 per cent. of the signal voltage, the noise reduction in the rectified signal will be about 700 to 1. When the noise is one-half the signal it appears in the output reduced by a factor of about 400 to 1. If the noise and signal become approximately equal, the actual improvement drops to some very low value of 2 or 3 to 1. Although the primary service area would be considerably enlarged if the suppression could be kept up to 400 or 500 to 1 when noise and signal were about equal, let us not forget that high-fidelity a-m reception requires signal to noise ratio of about 100 to 1. This is the region where the f-m system's ability to suppress unwanted noise is a maximum.



Inter-Station Interference.

Reference has been made to the efforts of early experimenters who tried to use f-m in order to pack more transmitters in the broadcast band. A big advantage of modern f-m transmitters is that a number of them may be assigned to the same frequency, provided they are several hundred miles or more apart. There will be no cross-modulation or interference. This is due to the fact that the f-m receiver will reproduce only the stronger of two signals, suppressing the weaker one, provided the ratio of the signal voltages in the receiver is 2 to 1 or more. F-m is at present limited by the FCC to frequencies of 40 mc or higher. The limit of satisfactory signal strength for such transmission is somewhere between 100 and 150 miles. We can visualise a large number of transmitters, all on the same wavelength, scattered across the country at distances of approximately 300 miles from each other. Each one covers its own primary service area without being affected by, or interfering with, the other transmitters on the same band. Present experiments indicate that even better results could be had if the assigned frequencies of the stations were separated by amounts as small as 10 or 15 kc. Due to the action of the detecting device in the f-m receiver, the suppression of unwanted signals would be still further increased. It is often possible, however, to pick up the weaker signal with a directive antenna which would increase the amount of desired signal available to the receiver.

The ability of the f-m transmitter to minimise natural and man-made interference and to magnify the wanted signal gives the system a cumulative advantage over present types. If we calculate the performance of an f-m transmitter and an a-m transmitter, both drawing about the same number of kw. from the lines of the local utility, the f-m system with a

band width of 150 kc. and the a-m system with a band width of 10 kc., we find that a theoretical overall improvement of more than 1000 to 1 may be secured. This improvement is measured by the accepted method—comparing the ratios of signal to signal-plus-noise permissible for high-fidelity reproduction.

Actual comparisons have shown the possibility of approaching this ratio in practical, every-day operations. Some allowance should be made for the circumstances attending the test, since u-h-f transmission of any type has advantages over the same system operated in the broadcast band. The tests would have been more acceptable had they compared a-m and f-m, both at the same high frequency. Sufficient additional improvement exists, however, to convince many investigators.

AUDIO SIGNAL FREQUENCY (Cycles per Sec.)	CARRIER AMPLITUDE	SIDE FREQUENCY AMPLITUDES								CORRESPONDING PHASE SHIFT.
		1st.	2nd.	3rd.	4th.	5th.	6th.	7th.	8th.	
10,000	100	2.5	-	-	-	-	-	-	-	2.9°
5000	100	5.0	-	-	-	-	-	-	-	5.7°
2500	99	9.9	-	-	-	-	-	-	-	11.5°
1000	93.8	24.2	3.1	-	-	-	-	-	-	28.6°
500	76.5	44	11.5	1.9	-	-	-	-	-	57.3°
250	22.4	57.7	35.3	12.9	3.4	-	-	-	-	114.6°
100	17.7	32.7	4.6	36.5	39.1	26.1	13.1	5.3	1.8	286°
Amplitudes are expressed as percent of unmodulated carrier.										

TABLE II.—Roder's calculations for frequency-modulated amplitude variations. Phase modulation (last column) should be restricted to less than 30 degrees to avoid serious distortion. Note that in phase modulation the phase shift varies inversely as audio frequency; in true frequency modulation the frequency deviation varies directly as the audio frequency.

Phase Shift.

Another operating advantage of f-m rests upon the fact that high audio frequencies are transmitted with the minimum phase shift in output, and low frequencies with the maximum. In a typical case cited by Major Armstrong, 30 cycles per second would be represented by a phase shift of 30 degrees; 10,000 cycles by a shift of but .09 degrees. Even after the series of multiplications required to change this shift to an f-m wave, the highest audio frequencies lie closest to the assigned carrier in phase relationship. Thus, a considerable amount of additional amplification may be given to all the higher audio frequencies without causing interference with adjacent programmes. Pronounced amplification of the highs in an a-m transmitter is limited in order to prevent cross-modulation of adjacent channels.

Cost Factors.

Another advantage of the f-m system is that the modulation of even the largest transmitter can be accomplished using the same type of tubes and components found in radio receivers, except for the final stages. A 50-kw. modulator bay is reduced to the approximate size of an 8 or 10 tube receiver chassis, although it includes its own power pack.

The maximum voltage (plate supply) applied to any component part of the modulator is only 180 volts. Such voltages are easily handled and filtered and represent an economical design which is reflected in the initial and lower maintenance cost of the complete transmitter. Voltages over 200 are found only in the power stages.

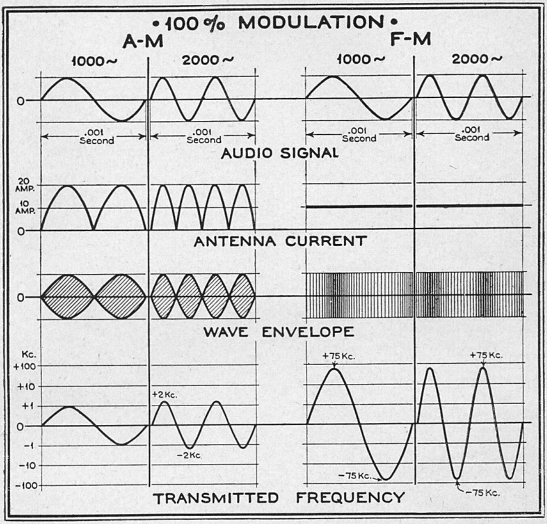
Further economy results from the fact that for equal transmitter power rating only about half the electrical energy is required from the power lines by an f-m system as compared to a-m. This economy is partly due to the fact that f-m lends itself admirably to the use of Class C output stages and also because the antenna current does not vary (during programme transmission) from the carrier level.

Some criticism of f-m is voiced because, in its modulating system, a small phase shift of not over 30 degrees must be multiplied, with strict linearity, several thousand times. The answer to this is that the modulator is relatively inexpensive. The carrier is modulated at a low energy level and the majority of the parts used in its construction, both tubes and components, are identical with those used in home receivers. This complexity of parts is merely that of numbers, since the actual circuits are doublers and triplers of a conventional type.

Economic Status.

Reference has been made earlier to an article in "Fortune," which strongly criticises the FCC and the broadcast industry for their apparent failure to enable the public to enjoy f-m programmes. Granting every advantage claimed by the strongest advocates of f-m, how can the industry begin to replace any major part of the a-m transmitters and receivers now in use? Their replacement value runs into billions of dollars. No programme has yet been evolved which offers the industry an economically sound way to change to f-m, overnight.

Perhaps an answer is developing at this very moment. Station WABC, for example, is now piping some of its programmes to Major Armstrong's transmitter at Alpine. The potential buyer of an f-m receiver may compare the quality of the two methods of transmission in the area served by the Alpine transmitter. If f-m continues to advance in public acceptance, a double system may be needed, until the public makes a final choice.

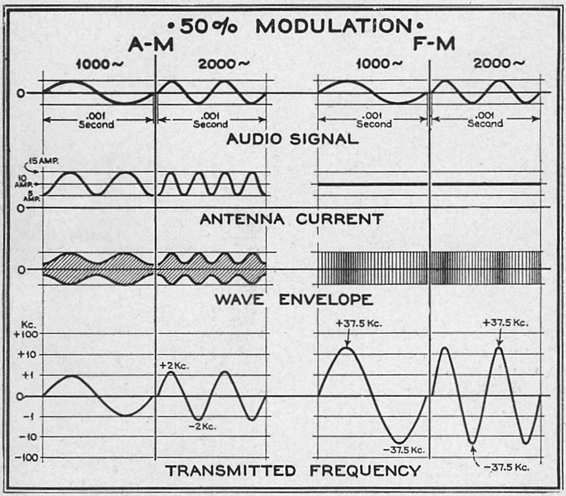


The variety and quality of American radio entertainment is admittedly the best in the world. It is paid for by advertisers, who buy time on the radio only because they can thus reach more people for a given expenditure than they can by competitive media. The individual broadcaster or

chain cannot change to f-m unless enough f-m receivers are in operation in his primary service area to permit him to charge the sponsor an adequate fee. The maker of receivers can offer f-m sets at attractive prices only if he is assured of a volume of sales. The public cannot be expected to buy an f-m receiver if it means that he must sacrifice the reception of his favourite programmes, or if the price is too high.

Transmission Fundamentals.

In order to compare the f-m and a-m systems in operation, we must first return to the fundamental problem of transmitting intelligence by radio. There are two variables which must be sent from the transmitter to the receiver, if we are faithfully to reproduce in the latter the programme originating in the studio. Each of these variables suffers wide changes independently of the other.



Since radio broadcasting in this country is a private undertaking, many factors must be weighed before a change can be authorised. Existing contracts with sponsors, competition, stockholders, patents, licences, are but a few. The remarkable point, in the opinion of many, is that a new and radical departure from the established system can have made the rapid progress which f-m has, in spite of these factors, all nominally opposed to sudden change.

They are the pitch or frequency of the programme material, and its volume.

In a conventional a-m transmitter the change in pitch is indicated by a change (in cycles per second) from the fixed carrier frequency. Thus, if an a-m transmitter, operating with double sidebands, were assigned a frequency of 42.8 mc., a 1000-cycle note would be broadcast when this transmitter was sending out a wave, the side frequencies of which would be

42.799 and 42.801 mc. Change in volume is signalled by a variation in the amount of current fed into the antenna of the transmitter. For example, if the antenna current is 10 amperes when no signal is being broadcast, this current would be increased to 20 amperes for 100 per cent. modulation, or the loudest sound which this system could transmit. An antenna current of 15 amperes would represent a sound about one-half as loud as the first, etc.

The first point of difference between the above system and f-m transmission is that the f-m station broadcasts a signal of constant amplitude whether modulated or not. Zero, 50 or 100 per cent. modulation would call for a 10 ampere antenna current in all cases, if we use the carrier power assumed for the a-m transmitter. The loudness of the sound presented to the microphone of the f-m system would be indicated by the frequency deviation of the side frequencies. If this station likewise operated on a carrier of 42.8 mc., 100 per cent. modulation would be indicated when the emitted frequency contained side frequencies of 42.725 to 42.875 mc. If 50 per cent. modulation was to be indicated, the frequency would vary between the limits of 42.7625 and 42.8375 mc. If no modulation was present, the transmitter would emit a single continuous frequency of 42.8 mc. If a 1000-cycle note is being fed into the microphone at an f-m station, the frequency swing will take place 1000 times in every second. Note that under no circumstances will the antenna current deviate from 10 amperes. We may summarise the comparison by stating that a-m indicates pitch by changing the frequency of the radiated energy; f-m by the time rate of change of frequency. The a-m system indicates percentage modulation by proportionate changes in the antenna current; f-m by varying the amount of frequency swing above and below its assigned carrier. See Fig. 5.

Experimenters have tried to apply frequency modulation to solve radio problems since the earliest days. It was tried on both spark transmitters and the early phone sets without success in either case. We can see now that one probable reason for these failures was that the experimenters were trying to compress the normal

ILLEGAL RADIO

Two Men Fined £100.

Extract from "The Argus," Wednesday, June 5.

SYDNEY, Tuesday.

Two men were each fined £100 by Mr. Balmain, S.M., at Bega Court today on charges of having established wireless transmitters and having sent messages without authority. They were Bertram James Schafer, of Bega Street, Bega, and Allen Henry Lee, of Newtown Street, Bega. Both pleaded guilty to the charges, brought under the Wireless Telegraphy Act.

Evidence showed that in October, 1939, the defendants constructed transmitting sets and sent messages and phonograph recordings to each other. From November, 1939, to April, 1940, observations were made by radio inspectors, and the transmitters were traced to the defendant's premises and seized. The defendants said that they had constructed the sets only to send messages to each other. However, they were heard in Sydney and Melbourne, and the sets were capable of sending messages oversea.

Mr. Balmain said that he regarded the matter as serious in view of the war. He imposed the maximum penalty in each case. Schafer and Lee were fined £50 on each charge, with £1/9/- costs, on each charge, in default 104 days' imprisonment. Both transmitters were ordered to be forfeited.

Frequency Modulation (Continued)

audio band of 10 kc. into one only 2 or 3 kc. wide. This, if successful, would have permitted many more transmitters to operate in the broadcast band. As we have seen, f-m has a solution to that problem to-day. It has achieved its success, however, by an exactly opposite method of attack. To-day's f-m transmitter transmits a band 100 or 150 kc. wide to reproduce in the home receiver an audio band of 15 kc. with fidelity. But there were many other problems which had to be overcome, however, before f-m could reach its present state of development.

(To be concluded.)

MICROPHONE TYPES

By A. G. Walz (ex-VK4AW)

(Continued from May, 1940.)

The Dynamic Microphone depends for its action on the induction of current in a coil of wire moving in a magnetic field. Similarity exists with the velocity except that in this case the currents induced could be termed eddy currents. An amateur version of the dynamic and used extensively, has been in the form of a midget permag speaker and very effective. The commercial product, of course, uses a dural diaphragm, and special chambers incorporated to relieve back pressure, enabling the whole job to be constructed in a convenient size for ease of handling. Along with the crystal, this type is now available in a streamlined case, not merely to add to the appearance, but with a definite object, a reduction of pick-up from the rear and sides, otherwise, a directional microphone, which finds many uses; P.A. equipment, especially where minimum feedback is essential, directional studio and outside work, where background noises are required to be suppressed. The beauty of these new types is that the mike can be tilted up to achieve non-directional pickup when it is required for that purpose.

The relative impedances and output levels of the various types should be of interest. These may be taken as average as variations with certain makes are quite appreciable.

	Impedence.	Level.
Magnetic Pickup	High Imp.	—10
D.B. Carbon	200 aside	—45
Reiss	500	?
Condenser	High Imp.	—97
Crystal Diaphragm	High Imp.	—45
Cell	High Imp.	—70
Velocity	1 ohm.	—100
Dynamic	10-30 ohms	—85

BOOKSHOP SMATTERINGS.

Signal Chaser.

("Radio News," March, 1940.)

This instrument would be invaluable to the conscientious serviceman who desires rapid signal checkings on a receiver. Briefly, the instrument is one whereby by means of probing rods one may check the signal in any part of a receiver, that is the RF, IF and AF channels and actually see what the signal is doing. Each section feeds into a 6 E5 magic eye tube giving visual indications of the happenings — full constructional details are given.

A Laboratory Vernier.

("Radio News," March, 1940.)

Where exact measurements are required some form of a precision vernier dial is essential and this article tells how to build one.

Standards on Electronics.

(Institute of Radio Engs.)

A booklet set up by IRE to cover standards for testing vacuum tubes, phototubes, photoelectric devices, etc., showing circuits and details of tubes.

"Standards on Radio Receivers."

(Institute of Radio Engineers.)

A publication by IRE on standards for checking receiver performances from the input to the output.

"Standards on Transmitters and Antennas."

(Institute of Radio Engineers.)

Checks and efficiency performances on transmitters and aerials are listed in this booklet.

"Electronic Keying."

("QST," April and May, 1940.)

Two articles appear on a new and interesting form of keying a transmitter or oscillator. Briefly, the principle is based on the gaseous discharge tube, the 885, which is capable of building up an electronic flow up to the ionisation point, after which the plate current suddenly collapses. By the means described in the articles it is possible to press a key similar to the old side swiper and when contact is made on one side, dots pour out of the 885 as long as the key is held over. Dashes are made when the key is pressed in the opposite direction. Perfect dots and dashes are automatically made and can be controlled from 15 to 40 words per minute.

LIST OF SHORT WAVE STATIONS HEARD.

By J. F. Miller,
152 Chapel Street, St. Kilda, Vic.

KGEI—15,330 Kc. 1956 m.—San Francisco—Heard at this frequency between 4 and 5 p.m.

DXU—15,320 Kc., 19.58 m.—Berlin—This station is heard at quite good strength around midday, usually on Sundays with several announcements in English.

DJQ—15,280 Kc., 19.63 m.—Berlin—Not at their usual strength during the late afternoon.

2RO6—15,300 Kc., 19.61 m.—Rome News from this station is given at 4.35 p.m., and is heard well at this time.

JZK—15,160 Kc., 19.79 m.—Tokio—An excellent signal, with news at 10.30 p.m.

YDC—15,150 Kc., 19.8 m.—Bandoeng—This station is the only one heard at any strength at night on this band of late.

GSF—15,140 Kc., 19.82 m.—London—At excellent strength around 9 a.m.

FFZ—12,050 Kc., 24.89 m.—Shanghai—This French station is now heard regularly at night, but is badly spoilt by morse.

RNE—12,000 Kc., 25 m.—Moscow—This Russian is one of the most powerful heard just before closing at 8 a.m.

VUD4 — 11,870 Kc., 25.27 m.—Delhi—Another Indian regular.

WLWO—11,875 Kc., 25.28 m.—Cincinatti, Ohio—Heard at only fair strength between 4 and 5 p.m., and drops slightly at night.

XMHA — 11,855 Kc., 25.3 m.—Shanghai—This station seems to carry a native programme only.

VLR3—11,850 Kc., 25.32 m.—Melbourne—Overseas and Australian news heard at excellent strength just before 8 a.m.

VLW3—11,830 Kc., 25.36 m.—Perth—Also heard with news at 7 p.m.—Excellent strength.

JZJ—11,800 Kc., 25.42 m.—Tokio—Heard at night with news at 10.0 p.m. JVW3 carries same programme but this station is at better strength.

Saigon.—11,780 Kc., 25.47 m.—F.I.C.—Definitely the loudest overseas station on this band, if not on the air. Special English programme in early evening.

DJD—11,770 Kc., 15.49 m.—Berlin—Heard at excellent strength around 1 p.m., with special broadcast to North America.

GSD—11,750 Kc., 25.53 m.—London—Heard with news at 4.15 p.m.

JVW3—11,720 Kc., 25.60 m.—Tokio—Carries same programme as JZJ, but not as good.

PLP—11,000 Kc., 27.27 m.—Bandoeng—Seems to be mainly native programme.

XGSE—9,780 Kc., 30.67 m.—Ching Quen, North China — Very poor quality, mainly native programme opening at 10 p.m.

ZHP—9,700 Kc., 30.94 m.—Singapore—News from the B.B.C. may be heard at 11.15 p.m.

GRX—9,690 Kc., 30.96 m.—London—This station is not usually heard here, but can be heard sometimes around 4 p.m.

XEQQ — 9,680 Kc., 30.99 m. — Mexico City—A fairly faint signal during the afternoon.

VLW2—9,650 Kc., 21.09 m.—Perth—Good at night.

KZRH — 9,640 Kc., 31.12 m.—Manilla—This is one of the regulars, carries excellent musical programme.

2RO3—9,630 Kc., 31.15 m.—Rome—Terrific strength, with news just before closing at 8 a.m.

TIPG—9,620 Kc., 31.19 m.—Costa Rica — Could easily identify the words "Costa Rico," which are mentioned quite often.

VLQ—9,615 Kc., 31.2 m.—Sydney—The best Australian around 11 p.m.

DXB—9,610 Kc., 31.22 m.—Berlin—Not as good as DJA.

HP5J—9,607 Kc., 31.23 m.—Panama City — Mainly native tongue spoken, but was fortunate to hear announcement sufficient to identify.

VUD3—9,590 Kc., 31.28 m.—Delhi—This Indian is the most powerful on this band, also the most regular.

Bookshop Smatterings (Continued)

"A Complete 56 mc. IF System."
("QST," April, 1940.)

The amplifier described, functions on 5 mc., and is usable for both FM and AM signal reception—an excellent article for UHF men.

"Improving the Flying Skywire,"
("QST," April, 1940.)

An article covering construction of kite aerials with (AWC) Automatic Wind Control. For use up to 1200 feet.

VLR—9,580 Kc., 31.22 m.—Melbourne—Carries same programme as 3AR quite often.

KZRM — 9,570 Kc., 31.35 m.—Manilla—Another regular Phill. Is. station, and is at best strength.

DJA—9,560 Kc., 31.38 m.—Berlin—This station is particularly good just prior to 4 p.m.

VPD2—9,535 Kc., 31.47 m.—Fiji—Heard at quite fair strength around 8 p.m.

KGE1—9,530 Kc., 31.48 m.—San Francisco—Can be heard on this frequency very well with news at 10.30 p.m. and 12.30 a.m. News items are particularly interesting.

TPC—9,520 Kc., 31.55 m.—Paris—Heard on 9/6/40 with special broadcast to North America. Have not heard since.

GSB—9,510 Kc., 31.55 m.—London—Another B.B.C. station heard at night.

XGOY — 9,500 Kc., 31.58 m. — Szechwan, China. Mainly native tongue spoken. Fair strength.

KZIB—9,500 Kc., 31.58 m.—Manilla—not as good as KZRM or KZRH. Fair signal with XGOY off the air.

ZBW3—9,525 Kc., 31.5 m.—Hong Kong.—Fair signal only—news at 10 p.m.

THE ARMY NEEDS OPERATORS.

We have been asked to advise all amateurs who are thinking of joining the A.I.F. as radio operators to communicate with Capt. P. E. Dunne, Southern Command Signals, Mt. Martha Camp, Victoria, who will advise them of the best method to adopt when enlisting. Applications are urgently required.

The magazine has just completed its annual balance and we have to report a loss on operations to the extent of £14 for the year. Some people will think it cheap W.I.A. advertising, but we look to all divisions to help maintain our circulation in order to reduce this loss which is again being borne by the Victorian Division.

We are grateful for help received, even when it is not acknowledged publicly, and we look to you to keep the good work going to the best of your ability.

Q.S.L. BUREAU

The following statistics show the growth of this Bureau's activity:—

Year.	Cards Handled.
1931	9,790
1932	18,333
1933	18,686
1934	22,043
1935	27,110
1936	43,707
1937	43,296
1938	41,155
1939	20,962
Grand Total	245,082

Roughly a quarter of a million cards in nine years, is a record of which to be proud.

Snow Campbell, VK3MR, now in the R.A.A.F., finds that great concentration is necessary when signing VMR, so as not to unconsciously sign his old call.

Glad to welcome Tom Hogan, VK3HX of Charlton to a city address. Tom now resides at 46 Hopetoun Ave., Canterbury, Victoria. Attend the June K.P. meeting. Try and make it each month Tom.

Herman Asmus, VK3ET, has been appointed a civilian instructor in the R.A.A.F., and shortly gets down to tin tacks.

According to Max Howden, VK3BQ, Arthur Berry, VK3CZ, forsook his single blessedness early in June. We have not seen much of Patto, VK3YP, since he met the same fate, s. Don't let this happen to you, Arthur.

Visitors to the June K.P. meeting included VK3PR, Ron Jardine, looking fit, and VK5ZZ, in the "blue uniform," and Jack Duncan, VK3VZ.

Stamp collectors requiring a South African contact should write to Mr. D. G. Alison, Secretary of the S.A.R.R.L., Box 7028, Johannesburg.

A complaint from VK5TK/BERS 195, Eric Trebilcock, now at Aeradio Station, Liverpool, N.S.W., re disposal of his Q.S.L.'s, will be thoroughly investigated. Please accept this as an acknowledgment of your letter, O.M.

According to latest advices, U.S. amateurs, have been forbidden to contact stations outside the States and its colonies.

The R.A.A.F. requires operators for ground duties within VK. Those

Divisonal Notes

IMPORTANT.

To ensure insertion all copy must be in the hands of the Editor not later than the 18th of the month preceeding publication.

N.S.W. DIVISIONAL NOTES.

The May monthly meeting of the Division was held as usual at Y.M. C.A. Buildings, and the attendance was again very good considering the lack of transmitting activities, DX and QSL cards. The manner in which members are making an appearance at meetings is very heartening to Councillors.

Some considerable discussion took place regarding an item in the morning papers, very ambiguously worded, regarding the activities of so-called Amateurs during war time. It was pointed out to members that the persons so far detected using transmitters illegally were "pirates," and in no case had any Licenced Experimenter offended, and that the Senior Radio Inspector was much impressed by the manner in which Amateurs were obeying the Regulations. It was decided that the Division write Federal Headquarters and ask that they take the matter up with the Minister responsible and also that the local press be advised as to the real state of affairs.

The question of appointing an Historian to write the history of the Division was mentioned, and members were of the opinion that the work should be carried out, and that a comprehensive history of the oldest Amateur Radio organisation in the world should be written. Our new Vice-President, Mr. F. Carruthers, was appointed Historian, and members may look forward to a comprehensive story of this Division's activities since the year 1910.

Now that the Division is operating under the original Charter of Incorporation, issued in 1922, it was thought fitting that those original signatories to the Articles and Memorandum of Association, who were not already Life Members of the Institute should have this honor conferred upon them.

It was also decided that the position of Patron to the Division, rendered vacant by the death of the Marchese Marconi some few years ago, should be filled, and Council were empowered to offer this position to a past President of the Division, Sir Ernest Fisk.

An interesting letter, received from the N.Z.A.R.T., giving some details of Experimental Radio in New Zealand since the outbreak of war, was read to members.

At the conclusion of general business, a very interesting lecture on "Ultra Violet Radiation" was given by Mr. M. Lusby, VK2WN. His talk, although a little removed from Radio proved very illuminating, and demonstrated use of so-called death rays against every day forms of bacteria.

Upon conclusion, a very hearty vote of thanks was accorded the lecturer.

Members are again requested to make known to the Secretary any change of address.

Q.S.L. Bureau (Continued)

making application should be either medically Class 2 or above the ordinary enlistment age. Enquirers should contact Flying Officer Marshall, Century House, Swanston Street, Melbourne, or telephone Central 970, switch 87.

Harry Kinnear, VK3KN, writing his apologies for continued non-attendance at meetings, states that although business precludes his being present, his interest in the movement is as keen as ever.

As a gesture to members in the services, the Council of the Victorian Division has decided to reduce subscriptions to 7/6 per annum (including magazine), to Victorian Division members serving in the navy, army, or R.A.A.F.

VICTORIAN NOTES

By VK3CX

The 4th June saw a large gathering of Victorian Division members at the club rooms when the main items on the programme was a two hours' entertainment furnished by the P.M.G.'s Department with the aid of "talkie shorts," showing subjects which varied from Lyrebirds in their native setting and surfing in Australia to getting gold and catching salmon in Canada. (No, no Mickey Mouse). The films themselves were exceptionally good, and the reproducing unit one of the best heard yet. Everybody present voted it a most enjoyable evening.

Among the visitors present were VK5ZZ, VK3PR, who is looking fitter than ever, and G6LU, who can hardly be called a visitor now as he is regarded as one of the family. RJ distributed a few, very few, QSL cards, JO told us the usual fairy story that we might be getting another copy of the magazine in a few days or weeks and the Secretary, UM, rang up to say that we could hold the meeting without his assistance. Lieut. TU was there and added a touch of khaki to the usual Air Force blue, which lately has been predominating these meetings since the war started. BQ was back in the fold after an absence of about six months or so, and tells us that he is still grinding commercial crystals and will have a fine stack of rejects (drift over two cycles per degree) to palm off on the boys when they want them again.

WU paid a visit to the Telephone Exchange and came away with many bright ideas for using Relays to do all his work when he gets on the air again. JI is passing the dull hours away by playing records using a crystal pick-up, and considers them very good. CO has been annoying his neighbours with recordings, and all was going well until a week ago when one of the neighbours broke under the strain and came and threatened CO that he would break all his records—he also called him a few names which had nothing to do with ham radio.

The Builders are still with us — XJ having built a new BC receiver and wonder of wonders, it worked first pop. IG has also got ideas about building an oscillocsope in the near future. He thinks he will be able to get it to work, because HK lives nearby and can be depended on.

One of our visitors, 5ZZ, said he is very disappointed with Melbourne beer, weather and women. We have always had a strong dislike for the weather anyway, but I don't think we will mention the other two subjects. He says he gets a kick out of working DX in the Air Force on low frequencies, but expects to go overseas very soon.

Speaking of the Air Force, I understand from Flying Officer V. Marshall, 3UK, that there are several vacancies for wireless operators in the home forces at the moment, and anyone interested should get in touch with him at Air Board immediately, when he will supply all particulars.

And still speaking of Air Raids, I overheard one ham ask another recently, "Did you see the mess they made of the Forth Bridge?" He queried, "Who?" "The seagulls." O.K., we will see ya at the next meeting, and once again don't forget that subscriptions will be due by the time that you read these lines. If you want the Institute to continue, don't forget to send along your sub. and attend the meetings, as you will be well repaid.

The Editor.

Dear Sir,

Whilst being in China and around the China coast, I have had the opportunity of meeting several "Amateurs" in the course of the last few months. Whilst in Hong Kong a few weeks ago, I met two English "hams" serving in the Royal Air Force, a very pleasant afternoon was spent chatting over radio news, etc.

In Hong Kong I was also introduced to several Chinese operators, mostly on ships, but running a station when ashore also. Is there any information re the "Amateur World" you would find handy? Of course, operations are banned here nowadays, but I could quite easily get any information you may desire. It might be interesting to know that radio gear here, including tubes, cost about half the price of the same goods in Australia, in fact, I have bought quite a lot of gear to bring home (someday!) Tubes being a quarter or even less.

I would esteem it a favour if you would inform any of the "Boys" (who may know me) of my present whereabouts, I left Australia in such a hurry that I didn't have time to see anyone!

Wishing you all the best, Sincerely,

HARRY WHITE,

ex-3IR.

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